Name:	***Performance-based Design Fire Protection***
Course Description:	This course examined Performance-base Design of a building or facility based on performance goals and objectives, engineering analysis, scientific measurements and quantitative assessment of alternatives against the design goals and objectives using accepted engineering tools, methodologies and performance criteria.
Prerequisites:	Algebra Fire Protection Systems Fire Behavior Building Construction
Outcomes:	1. Given examples of a performance-based design and a prescriptive-base design, describe the differences. 2. Given a fire spread scenario, explain the progression of the fire from start to extinguishment. 3. Given specific life safety criteria and non-life safety criteria requirements, determine whether a performance-based building design submitted for approval would meet the criteria of the local jurisdiction. 4. Describe the capabilities and limitations of the fire model(s) on which the design was based. 5. Evaluate performance-base design reports and verify whether documentation submitted is adequate. 6. Comprehend the types of building commissioning and acceptance testing associated with performance-based design buildings. 7. Identify and analyze field changes, building limitations, allowable alterations and renovations. 8. Describe the dynamics of fire.
Available Student Texts:	*The Code Official's Guide to Performance-Based Design Review;* Society of Fire Protection Engineers and International Code Council *SFPE Engineering Guide to Performance-Based Fire Protection Analysis and Design of Buildings;* National Fire Protection Association and Society of Fire Protection Engineers

Supporting References/Research for Faculty and Students:	**U.S. Fire Administration** *Building Construction, Combustible & Non-Combustible,* U. S. Fire Administration Publications: http://www.usfa.dhs.gov/applications/publications See Arson, Fire Data, Fire Protection, Fire Service Operations, Hazardous Materials, Health and Safety, Wildfire Applied Research: http://www.usfa.dhs.gov Research Reports: http://www.usfa.dhs.gov Technical Reports: http://www.usfa.dhs.gov/applications/publications Lessons Learned Information Sharing: Topical Fire Research Series: http://www.usfa.dhs.gov/research Learning Resource Center: http://www.lrc.fema.gov **National Institute for Standards and Technology** http://www.fire.nist.gov: See Publications, FIREDOC (under Publications) Lessons Learned Information Sharing: **References** Society of Fire Protection Engineers: http://www.pentoncmg.com/sfpe/index.html **Current Events/News** http://www.firehouse.com http://www.fireengineering.com
Assessment:	Students will be evaluated for mastery of learning objectives by methods of evaluation to be determined by the instructor.
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Course Outline

Performance-based Design Fire Protection

I. Introduction
- A. Purpose
- B. Scope
- C. Comparison of Performance-Based Design with Prescriptive-Based Design
- D. Performance-Based Design Issues
- E. Performance-Based Design Submittals

II. Fire and Building Code Review
- A. Fire Protection Systems
- B. Means of Egress
- C. Structural Elements
- D. Interior Finish

III. Code Official's Role in Performance-Based Design
- A. Key Aspects of the Code Official's Role
- B. Building Commissioning and Testing
- C. Legal Liabilities of the Code Official

IV. Fire Dynamics
- A. Fire Triangle/Tetrahedron
- B. Ignition Process
- C. Fuel Characteristics
- D. Fire Development
- E. Growth Rate
- F. Structural and Building Contents Influences
- G. Ventilation
- H. Toxicity

V. The Performance-Based Design Process
- A. Scope
- B. Fire Safety Goals
- C. Fire Safety Objectives
- D. Performance Criteria
- E. Trial Fire Designs
- F. Evaluation of Trial Fire Designs
- G. Selection of the Final Trial Fire Design

VI. Fire Models
- A. Types of Models
- B. Uses and Limitations
- C. Factors Affecting Models Used
- D. Input Data
- E. Model Output

VII. Fire Tests
- A. Types of Fire Tests
- B. Uses and Limitations

VIII. Responsibilities of the Owner, Designer and Code Official
- A. Team Approach
- B. Owner Responsibility
- C. Designer Responsibility
- D. Code Official Responsibility

VIII. Performance-Based Design Team Member Qualifications
- A. Owner's Team Qualifications
- B. Reviewer's Team Qualifications

IX. Contract Review/Peer Review
- A. Contract Reviewer
- B. Peer Review

X. Defining Objectives, Functional Statements and Performance Requirements
- A. Objectives
- B. Functional Statements
- C. Development of Performance Requirements
  - 1. Life Safety Criteria
  - 2. Non-life Safety Criteria

XI. Design Fire Scenarios
- A. Identifying Design Fire Scenarios
  - 1. Probabilistic Approaches
  - 2. Deterministic Approaches
- B. Fire Characteristics
- C. Building Characteristics
- D. Occupant Characteristics

XII. Fire Protection Design Strategies
- A. Functional Statements
- B. Performance Requirements
- C. Trial Designs

XIV. Methods for Evaluating Designs
- A. Methods of Performance Assessment
- B. Levels of Design
- C. Deterministic and Probalistic Methods
- D. Methods for Addressing Limitations/Uncertainties

XV. Documentation
- A. Importance of Documentation
- B. Documentation Overview
- C. Responsibility for Providing Documentation
- D. Forms of Documentation
- E. Submittal Requirements

XVI. Building Commissioning and Acceptance Testing
- A. The Process of Commissioning and Acceptance Testing

B. Evaluation of Acceptance Testing/Commissioning Results
C. Evaluation of Materials and Methods

XVII. Field Changes and Adherence to Design Documents
A. Quality Control During Construction
B. Identification of Field Changes
C. Reporting and Documentation of Field Changes
D. Code Official Review and Acceptance of Field Changes

XVIII. Operations and Maintenance
A. Operations and Maintenance Program
B. Operation and Maintenance Manuals
C. Limitations on Use of the Building
D. Management of Change Protocol
E. Facilities Staffing and Training Issues
F. Testing and Maintenance
G. Compensatory Measures
H. Control of Fuel Loading
I. Allowable Alterations
J. Inspections by the Code Official

XIX. Managing Building Changes
A. Building Operations
B. Renovation Within the Scope of the O&M Manual
C. Renovation/Change of use Beyond Scope of O&M Manual

XX. Final Project of a Performance-Based Design